

What is claimed is:

1. An integral circuit protection device providing overcurrent and overvoltage protection for a circuit and configured to be connected to the circuit, comprising:

5 an overcurrent protection portion;
an overvoltage protection portion; and
a plurality of terminals for connecting both the overvoltage and overcurrent protection portions of the integral circuit protection device to the circuit to be protected, wherein a part of the overvoltage protection portion serves as one of the plurality of terminals.

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2. The integral circuit protection device of claim 1, wherein the plurality of terminals includes first, second and third terminals, the part of the overvoltage protection portion serving as one of the plurality of terminals being the third terminal, the overcurrent protection portion being electrically connected between the first and second terminals, and the overvoltage protection portion being connected to the second terminal.

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3. The integral circuit protection device of claim 1, wherein the overcurrent protection portion includes a fuse.

4. The integral circuit protection device of claim 1, wherein the overvoltage protection portion includes a bi-directional thyristor.

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5. The integral circuit protection device of claim 1, wherein the plurality of terminals are configured to electrically connect the overcurrent protection portion in series with the circuit to be protected and to electrically connect the overvoltage protection portion in parallel with the circuit to be protected when the integral circuit protection device is electrically connected to the circuit to be protected.

6. The integral circuit protection device of claim 1, further comprising:

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a thermally conductive portion that conducts heat away from the overvoltage protection portion.

7. The integral circuit protection device of claim 6, wherein the thermal coefficients of the thermally conductive portion and overvoltage protection portion are substantially the same.

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8. The integral circuit protection device of claim 1, wherein the first, second and third terminals are formed on at least one same side of the integral circuit protection device.

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9. The integral circuit protection device of claim 1, wherein the integral circuit protection device is configured for mounting on a printed circuit board.

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10. The integral circuit protection device of claim 1, wherein the integral circuit protection device is configured substantially the same as a standard telecommunications fuse configuration.

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11. The integral circuit protection device of claim 2, further comprising:

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a second overcurrent protection portion;
a second overvoltage protection portion;
fourth and fifth terminals as part of the plurality of terminals; and
wherein the second overcurrent protection portion is electrically connected between the fourth and fifth terminals, the second overvoltage protection portion is connected to the fifth terminal, a part of the second overvoltage protection portion jointly serves as the third terminal, and the third terminal is connected to ground.

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12. The integral circuit protection device of claim 11, further comprising:

a third overvoltage protection portion connected between the third terminal and ground.

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13. A circuit element for overvoltage and overcurrent protection of a circuit, comprising:

a circuit element mounting member having first, second and third terminals;

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an overcurrent protection device electrically connected between the first and second terminals, the overcurrent protection device being contained by the circuit element mounting member; and

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an overvoltage protection device electrically connected to the second terminal and being contained by the circuit element mounting member, wherein a part of the overvoltage protection portion serves as the third terminal.

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14. The circuit element of claim 13, wherein the circuit element mounting member is further comprised of a tube having an outer surface and an inner hollow portion;

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wherein the overcurrent protection device is disposed within the inner hollow portion of the tube, and each of the overvoltage protection device, the first terminal and the second terminal is disposed on the outer surface of the tube.

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15. The circuit element of claim 13, wherein the overcurrent protection device is a fuse configured to protect the circuit from excessive currents.

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16. The circuit element of claim 13, wherein the overvoltage protection device is a thyristor configured to protect the circuit from excessive voltages.

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17. The circuit element of claim 14, wherein the tube further has a first end and a second end, the first terminal being disposed at the first end, and the second terminal being disposed at the second end opposite from the first terminal.

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18. The circuit element of claim 17, wherein the first and second terminals include electrically conductive layers disposed on the outer surface of the tube adjacent to each of the first and second ends and extending into part of the inner hollow portion adjacent to the first and second ends:

wherein the electrically conductive layers are electrically connected to the overcurrent device disposed within the inner hollow portion of the tube.

5 19. The circuit element of claim 13, further comprising:
an integrally formed bond pad and connector piece connected between
the second terminal and the overvoltage protection device.

10 20. The circuit element of claim 13, wherein the overcurrent device
is electrically connected in series with the circuit to be protected and the
overvoltage protection device is electrically connected in parallel with the
circuit to be protected.

15 21. The circuit element of claim 13, wherein the circuit element
mounting member further comprises:
a substrate having first and second surfaces; and
a plurality of wire terminations disposed on at least one of the first and
second surfaces, wherein at least the first and second terminals are each
respectively comprised of one of the plurality of wire terminations.

20 22. The circuit element of claim 21, wherein the overcurrent
protection device is comprised of a fuse element electrically connected
between the first and second terminals and disposed on at least one side of
the substrate, and the overvoltage protection device is comprised of a
thyristor electrically connected to the second terminal and disposed on at
least one side of the substrate.

25 23. The circuit element of claim 21, further comprising:
an atmospherically resistant encapsulant disposed on at least one side
of the substrate and having a fuse element and thyristor therebetween.

30 24. The circuit element of claim 21, wherein the first, second and
third terminals are formed on at least a same side of the circuit element.

35 25. The circuit element of claim 21, further comprising:
an integrally formed bond pad and connector piece connected between
the second terminal and the overvoltage protection device.

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26. The circuit element of claim 13, wherein the circuit element mounting member is comprised of a thermally conductive material..

5 27. The circuit element of claim 13, wherein the circuit element is formed as a discrete component for mounting on a printed circuit board, and wherein the first, second and third terminals contact a surface of the printed circuit board upon placement thereon.

10 28. The circuit element of claim 14, further comprising:
a second overcurrent protection device;
a second overvoltage protection device;
fourth and fifth terminals; and
wherein the second overcurrent protection device is electrically connected between the fourth and fifth terminals, the second overvoltage protection device is connected to the fifth terminal, a part of the second overvoltage protection device jointly serves as the third terminal, and the third terminal is connected to ground.

15 29. The integral circuit device of claim 28, further comprising:
a third overvoltage protection device connected between the third terminal and ground.

20 30. A method for providing an overcurrent and overvoltage device in a telecommunications circuit, the method comprising the steps of:
providing a mounting member configured to receive an overcurrent protection element and an overvoltage protection element, the mounting member having a plurality of terminals;
disposing the overcurrent and overvoltage protection elements within the mounting member such that the overcurrent protection element is electrically connected between first and second terminals of the plurality of terminals, the overvoltage protection element is electrically connected to the second terminal, and a part of the overvoltage protection element serves as a third terminal of the plurality of terminals; and
30 connecting the mounting member as a single discrete element to a circuit board that includes the telecommunications circuit.

35 31. The method of claim 30, further comprising the steps of:

electrically connecting one of the first and second terminals to a first incoming line to the telecommunications circuit and electrically connecting the other of the first and second terminals to the telecommunications circuit such that the overcurrent protection element is connected in series with the telecommunications circuit; and

electrically connecting the third terminal to a second incoming line to the telecommunications circuit such that the overvoltage protection element is connected in parallel with the telecommunications circuit.

10 32. The method of claim 30, further comprising the steps of:
 providing the mounting member with both a second overcurrent
 protection element and a second overvoltage protection element; and

15 disposing the second overcurrent and overvoltage protection elements within the mounting member such that the second overcurrent protection element is electrically connected between fourth and fifth terminals of the plurality of terminals and the second overvoltage protection element is electrically connected between the third and fifth terminals of the plurality of terminals.

20 33. The method of claim 32, further comprising the steps of:
 electrically connecting one of the first and second terminals to a first
 incoming line to the telecommunications circuit and electrically
 connecting the other of the first and second terminals to the
 telecommunications circuit such that the overcurrent protection element is
 connected in series with the telecommunications circuit;
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electrically connecting one of the fourth and fifth terminals to a second incoming line to the telecommunications circuit and electrically connecting the other of the fourth and fifth terminals to the telecommunications circuit such that the second overcurrent protection element is connected in series with the telecommunications circuit; and

electrically connecting the fifth terminal to the second incoming line to the telecommunications circuit such that the overvoltage protection element and second overvoltage protection element are jointly connected in parallel with the telecommunications circuit.

34. The method of claim 32, further comprising the step of:

providing the mounting member with a third overvoltage protection element; and

disposing the third overvoltage protection element within the mounting member such that the third overvoltage protection element is electrically connected between the third terminal and ground.

35. The method of claim 34, further comprising the steps of:
electrically connecting one of the first and second terminals to a first incoming line to the telecommunications circuit and electrically connecting the other of the first and second terminals to the telecommunications circuit such that the overcurrent protection element is connected in series with the telecommunications circuit;

electrically connecting one of the fourth and fifth terminals to a second incoming line to the telecommunications circuit and electrically connecting the other of the fourth and fifth terminals to the telecommunications circuit such that the second overcurrent protection element is connected in series with the telecommunications circuit; and

electrically connecting the fifth terminal to the second incoming lines to the telecommunications circuit such that the overvoltage protection element and second overvoltage protection element are jointly connected in parallel with the telecommunications circuit.

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